

FOULING POLYZOANS OF BOMBAY OFFSHORE WATERS

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ABSTRACT

Seven cheilostomatan and one cyclostomatan polyzoan observed as members of fouling communities in offshore waters of Bombay High have been reported here. Their systematic account, species description and distribution have been briefly mentioned.

Key words: Polyzoan, fouling, Bombay High, Offshore waters

Studies on fouling polyzoans are mainly restricted to the coastal waters of India (Chhapgar & Sane, 1966; Menon, 1972; Menon & Nair, 1967, 1969, 1970, 1975; Pillai, 1978 & 1981; Pillai & Santhakumaran, 1971; Rao, 1975; Rao & Ganapati, 1972a & 1972b, 1975, 1980; Rao, Saraswathi and Bhavanarayana, 1988 and De Souza, 1988) and there are hardly any report from offshore regions. The present paper deals with the fouling polyzoans from the offshore waters of Bombay High area; a station situated approximately 160 km off Bombay. The water column in this area extends upto a depth of 76 m. Test coupons of *Mangifera indica* (mango wood, 15 x 10 x 2.5 cm) were exposed for varying durations (ranging from one month to one year) at 2, 22, 42 and 62 m during the period May, 1983 to February, 1986 to collect the specimens. A total of 320 coupons were examined during the study period. The polyzoan species recorded are as follows:-

Phylum	:	BRYOZOA	Ehrenberg, 1831
Subphylum	:	ECTOPROCTA	Nitsche, 1869
Class	:	GYMNOLAEMATA	Allman, 1856
Order	:	Cyclostomata	Busk, 1852
Suborder	:	Articulata	Busk, 1859
Family	:	Crisiidae	Johnston, 1847
Genus	:	Crisia	Lamx., 1812

Crisia elongata Milne Edwards, 1838

Description : Zoarium erect, bushy, well branched. Branches elongate with jet black chitinous joints. Zooids tubular, alternate and fused in the middle, noticeable on the ventral side. Ovicells broad at the middle of the internode.

Remarks : This species was present on panels exposed at all the four depths. Of the total 320 panels examined, they were observed only on eight panels.

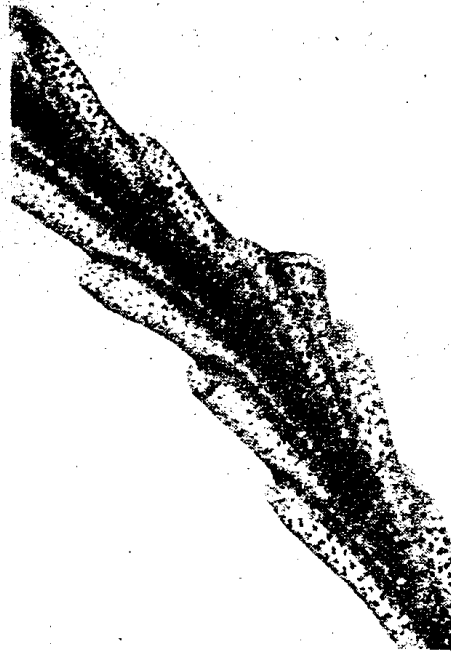


Fig. 1. *Crisia elongata* (18 x)

Previous records from India : So far it has been reported only from Mandapam (Menon, 1967) and Visakhapatnam (Rao, 1975) areas along the east coast of India. This is its first report from the Arabian sea.

Geographical distribution : Red Sea, Ceylon, Indo- Australian Archipelago, Fiji, Naples, Gulf of California, East Africa, Costa Rica and India.

Order	:	Cheilostomata	Busk, 1852
Suborder	:	Anasca	Levinsen, 1909
Family	:	Membraniporiidae	Busk, 1854
Genus	:	Membranipora	Blainville, 1830

***Membranipora savartii* (Audouin, 1826)**

Description : Zooids quadrangular or elongate, cryptocyst bears tiny tubercles, the proximal cryptocyst possesses a characteristic broad denticulate process projecting into the large orifice beneath opesia in several zooids.



Fig. 2. *Membranipora savartii* (18x)

Remarks : Observed only on one panel exposed during the month of August, 1983 at 22 m.

Previous records from India : Its occurrence was reported from Mangalore (Thornley, 1907); Kanyakumari (Menon, 1967) and Bombay harbour (Chhapgar & Sane, 1966; Karande, 1968; Santhakumaran & Pillai, 1970; Pillai, 1981) along the west coast and from Visakhapatnam (Rao & Ganapati, 1972a & Rao, 1975).

Geographical distribution : *M. savartii* is a common species around the world in warmer shallow waters (Pillai, 1981). It has been reported earlier from the Gulf of Mexico, West Atlantic, Red Sea, East Indies, Indian Ocean, Ceylon, Australia, California, Japan, Brazil, Puerto Rico and Caribbean.

Membranipora perfragilis (Mac Gillivray, 1881)

Description : Zooids regular in form with finely crenated parallel lateral walls and an acute distal wall. Opesia occupying nearly all of the front. No ovicells or spines. Incipient interzooidal avicularia rarely present.

Remarks : Observed on panels exposed at 22 (one panel), 42 (five panels) and 62 m (one panel) depths.

Previous records from India : Along the west coast, it has been reported earlier from off Travancore & off Karwar. Along the east coast its occurrence was reported

from Madras, Andaman Islands, Orissa coast (Robertson, 1921) and Visakhapatnam (Rao, 1975).



Fig.3. *Membranipora perfragilis*

Geographical distribution : Japan, Australia, California, India, Burma (Mergui Archipelago).

Family	:	Thalamoporellidae	Levinsen, 1902
Genus	:	Thalamoporella	Hincks, 1887

Thalamoporella stapifera Levinsen, 1909

Description : Cryptocyst porous and granulated, opesiules unequal. Condyles present, ovicells large, ovicell hood imperforate, large and overhangs adjacent zooids. Spicules medium sized and large compasses and stirrup shaped, small callipers.

Remarks : Highest frequency (observed on 28 panels) of occurrence was noticed on panels exposed at 2 m depth. Very rarely observed (only on two panels) at 22 m depth also.

Previous records from India : Its occurrence was reported earlier only from Visakhapatnam area from a variety of substrata in the intertidal region (Rao & Viswanadham, 1984). This is its first report from the Arabian Sea.

Geographical distribution : Andaman & Nicobar Islands, Timor, Hawaii, Indo Pacific, China, India.



Fig. 4. *Thalamoporella stapifera* (18x)

Family	:	Bicellariellidae	Levinsen, 1909
Genus	:	Bugula	Oken, 1815

Bugula neritina (Linnaeus, 1758)

Description : Erect colony, brownish in colour. Branches are composed of zooecia in two series. No spines present, but the free distal angle of the outer margin projects slightly. Avicularia absent.



Fig. 5. *Bugula neritina* (18x)

Remarks : Presence was noticed only once on a panel exposed at 2 m depth during January, 1984.

Previous records from India : Along the west coast, it has been reported earlier from Bombay harbour (Karande, 1968) and Mormugao harbour (De Souza, 1988). It has been reported as a major fouling species from Madras harbour (Robertson, 1921) and Visakhapatnam harbour (Rao & Ganapati, 1978)

Geographical distribution : They are widely distributed throughout the warmer waters of the world especially in ports and harbours (Ryland, 1965). A major fouling species at ports in Southern Britain, Mediterranean, Beaufort (Maturo, 1959), La Jolla and San Diego (Coe & Allen, 1937), Australian (Sydney harbour; Wisely, 1959) and New Zealand ports (Ryland, 1971).

Bugula bengalensis Satyanarayana Rao & Ganapati, 1972

Description: Opesia occupies nearly 2/3rd of the length of the zooid. The distal spine formula is 2:1. Avicularia situated above the mid-point of the zooid on the lateral margin, shorter head. Ovicells globose.

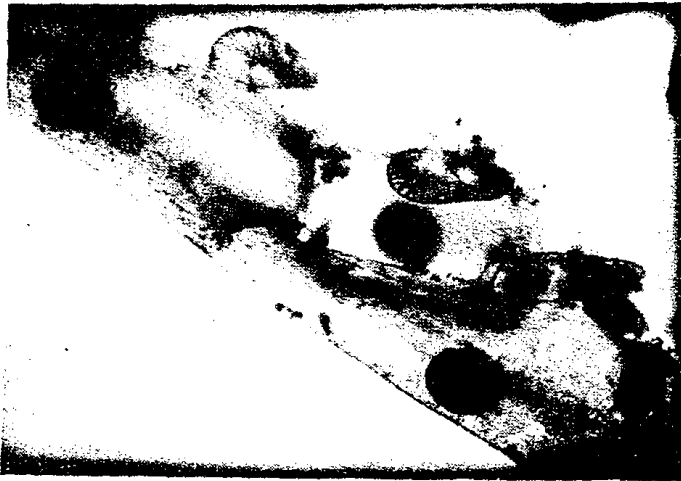


Fig. 6. *Bugula bengalensis* (18x)

Remarks : Of rare occurrence; observed only on three panels, two exposed at 2 m depth and one at 42m depth.

Previous records from India : It has been reported earlier from Mormugao harbour (De Souza, 1988) and Visakhapatnam (Rao & Ganapati, 1972a).

Geographical distribution : Indian Ocean.

Suborder	:	Ascophora	Levinsen, 1909
Family	:	Mucronellidae	Levinsen, 1902
Genus	:	Rimulostoma	Vig., 1949

Rimulostoma signatum

Description : Numerous, minute, regularly arranged tubercles cover the frontal. Orifice with a sinus and two condyles. Avicularia unilateral, directed proximally, pointing obliquely outwards. Occasionally ovicells with minute pores. There may be two avicularia.



Fig. 7. *Rimulostoma signatum* (18x)

Remarks : Observed a few colonies on a panel exposed during postmonsoon, 1984-85 at 2m depth and on another panel exposed at 62m depth exposed during February-October, 1984.

Previous records from India : So far not recorded, this being its first report.

Family	:	Catenicellidae	Busk, 1852
Genus	:	Vittaticella	Maple, 1900

Vittaticella sp.

Description : Zooids typically vase-shaped, the sides straight. Vittae lateral, almost reaching the infrascapular chambers "autozoecial vittae" of the distal zooids,

lateral in the distal half but arrived inwardly at the proximal side. Ovicells with uniserial marginal pores.

Remarks : Observed a few colonies on a panel exposed at 42 m during June, 1983-January, 1984.

Fouling fauna at this offshore station was rich and diverse, comprising not less than sixty species (Raveendran, 1989) of which bryozoans were represented by eight species. Bryozoans, though not an important component of fouling on majority of the panels exposed at this site, showed high coverage by *T. stapifera* on seasonal panels exposed at 2 m depth during monsoon, 1983 (36%), and 1984 (42%) and premonsoon, 1985 (43%). Similarly, panels exposed at 42 m depth during monsoon, 1984 showed a high coverage of 47 % by *M. perfragilis*.

In general, bryozoan representation at 22 and 62 m depths was poor compared to 2 and 42 m depths. It may be mentioned here that 22 m depth zone is an oyster predominated zone and predation of larvae by the oysters could be one of the reasons for their poor representation at this particular depth.

The probable source for the larval supply to the test coupons exposed at this site could be through i) currents, ii) ships and iii) the larvae of autochthonous origin from the platform. Currents operating between this offshore site and Bombay (Gouveia and Kurup, 1977) might have played some role in the colonisation of the panels by transporting larvae from their coastal brood sites. Supply boats and oil tankers which are frequently in operation between this station and the coast may be augmenting this supply.

The most important larval source to the test coupons exposed at this station could be the larvae of autochthonous origin i.e., those released from the fauna already existing on the offshore platforms. It may be pointed out here that the Bombay High oil field is occupied with a large number of platforms which were present well before the commencement of the present investigations. These platforms might have developed a well established fauna and therefore, they could form the source for a tremendous supply of larvae for fresh settlement. Hence, the larvae of autochthonous origin will be one of the primary sources for colonisation on the experimental panels. This steady source of larvae, no doubt, is further supplemented to some extent, by occasional supply through ships and currents originating from their coastal brood sites.

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REFERENCES

- Chhappgar, B.F. and S.R. Sane, 1966. Intertidal Entoprocta and Ectoprocta (Bryozoa) of Bombay. *Journal of Bombay Natural History Society*, 63 : 449-454.
- Coe, W.R. and W.E. Allen, 1937. Growth of sedentary marine organisms on experimental blocks and plates for nine successive years at the pier of the Scripps Institution of Oceanography (Technical series), 4 : 101-136.
- De Souza, A.P., 1988. *Studies on fouling bryozoans*. M.Sc. thesis, Goa University. 153pp.
- Gouveia, A.D. and P.G. Kurup, 1977. Probable movement of a hypothetical oil patch from Bombay High region. *Indian Journal of Marine Sciences*, 6C : 118-121.
- Karande, A.A., 1968. Studies on marine fouling and boring organisms in Bombay harbour. In: *Proceedings of 2nd International Congress on Marine Corrosion and Fouling*, p. 563-569.
- Maturo, F.J.S. (Jr), 1959. Seasonal distribution and settling rates of estuarine bryozoa. *Ecology*, 40 : 116-127.
- Menon, N.R., 1967. *Studies on the polyzoa of the south-west coast of India*, Ph.D. thesis, University of Kerala, 548 pp.
- Menon, N.R. and N.B. Nair, 1967. Observations on the structure and ecology of *Victorellapavida* Kent (Bryozoa) from the south-west coast of India. *Internationale Revue der gesamte Hydrobiologie*, 52 : 237-256.
- Menon, N.R. and N.B. Nair, 1969. Notes on *Alcyonidium erectum* Silen (Ectoprocta) from the Indian Ocean. *Current Science*, 38 : 439-440.
- Menon, N.R. and N.B. Nair, 1970. Three species of the genus *Tremogasterina* from the Indian Ocean. *Current Science*, 39 : 135-136.
- Menon, N.R., 1972. Species of genus *Parasmittina* (Bryozoa, Ascophora) from Indian waters. *Marine Biology*, 14 : 72-84.
- Menon, N.R. and N.B. Nair, 1975. Indian species of *Malacostega* (Polyzoa, Ectoprocta). *Journal of Marine Biological Association of India*, 17 : 553-579.
- Pillai, S.R.M. and L.N. Santhakumaran, 1971. Two new records of bryozoans from Indian waters. *Journal of Bombay Natural History Society*, 68 : 842-844.
- Pillai, S.R.M., 1978. A new species of *Hippoporina* (Ectoprocta, Ascophora) from Bombay waters. *Current Science*, 47 : 61-63.
- Pillai, S.R.M., 1981. Further report on the taxonomy of fouling bryozoans of Bombay harbour and vicinity. *Journal of Bombay Natural History Society*, 78 : 317-329.

- Rao, K.S. and P.N. Ganapati, 1972a. Some new and interesting bicellariellids (Polyzoan:Cheilostomata) from Visakhapatnam coast. *Proceedings of the Indian National Science Academy*, 38 : 212-219.
- Rao, K.S. and P.N. Ganapati, 1972b. On the common anascan genus *Electra* from Visakhapatnam and its vicinity. *Proceedings of the Indian National Science Academy*, 38 : 220-224.
- Rao, K.S., 1975. *The Systematics and some aspects of the Ecology of Littoral bryozoa on the north-east coast of India*, Ph.D. Thesis, Andhra University, Waltair, 235 pp.
- Rao, K.S. and P.N. Ganapati, 1975. Littoral bryozoa in the Godavari estuary. In: *Contributions to Estuarine Biology, third all India Symposium*. Estuarine Biology edited by C.V. Kurian, p. 591-600.
- Rao, K.S. and P.N. Ganapati, 1978. Ecology of fouling bryozoans at Visakhapatnam Harbour. *Proceedings of Indian Academy of Sciences (Animal Sciences)*, 87 : 63 - 75.
- Rao, K.S. and P.N. Ganapati, 1980. Epizoic fauna of *Thalamoporella* var. *indica* and *Pherusella tubulosa* (Bryozoa). *Bulletin of Marine Sciences*, 30 : 34-44.
- Rao, K.S. and Viswanadham, 1984. First description of the ancestrula of *Thalamoporella stapifera* and preliminary observations on its early astogeny. *Geobios New Reports*, 3 : 90-92.
- Rao, K.S., M. Saraswathi and P.V. Bhavanarayana, 1988. Entoprocta in the fouling communities at the Visakhapatnam harbour, Bay of Bengal. In: *Marine Biodeterioration, Advanced Techniques Applicable to the Indian Ocean* edited by M.F. Thompson, R. Sarojini and R. Nagabhushanam. p. 57-79.
- Raveendran, T.V., 1989. *Studies on Marine Organisms Affecting Timber*. Ph. D. Thesis, University of Bombay, 180 pp.
- Robertson, A., 1921. Report on a collection of bryozoa from the Bay of Bengal and other eastern seas. *Records of Indian Museum*, 22 : 33-65.
- Ryland, J.S., 1965. *Catalogue of main marine fouling organisms (found on ships coming into European waters) 2. Polyzoa*. O.E.C.D., Paris. p. 1-82.
- Ryland, J.S., 1971. Bryozoa (Polyzoa) and marine fouling. In: *Marine borers, fungi and fouling organisms of wood* (edited by E.B. G. Jones and S.K. Eltringham), O.E.C.D., Paris, p. 137-154.
- Santhakumaran, L.N. and S.R.M. Pillai, 1970. Marine foulers in Bombay waters, Barnacles and Polyzoans. In: *The Central Institute of Fisheries Education Annual Day Souvenir*, May 1970, p. 32-34.
- Thornley, R.L., 1907. Report on the marine Polyzoa in the collection of the Indian Museum. *Records of Indian Museum*, 1 : 179-196.
- Wisely, B., 1959. Factors influencing the settling of the principal marine fouling organisms in Sydney harbour. *Australian Journal of Marine and Fresh Water Research*, 10 : 30-44.